

WHAT IS CLAIMED IS:

1. A process for preparing a hydrogenated conjugated diene block copolymer comprising the steps of:

- 5 (a) charging a solvent, a microstructure control agent, and an alkenyl aromatic hydrocarbon monomer into a first reactor forming an admixture of solvent, a microstructure control agent, and an alkenyl aromatic hydrocarbon monomer wherein the concentration of the microstructure control agent is from about 5 to about 10 weight percent;
- 10 (b) titrating the admixture of solvent, microstructure control agent, and alkenyl aromatic monomer using an anionic polymerization initiator to form a living polymer;
- (c) allowing sufficient time for the living polymer to react with and incorporate the alkenyl aromatic monomer;
- 15 (d) charging a conjugated diene monomer into the first reactor;
- (e) allowing sufficient time for the living polymer to react with and incorporate the conjugated diene monomer to form a living block copolymer; and
- 20 (f) hydrogenating the living block copolymer to form a hydrogenated conjugated diene block copolymer using a cobalt hydrogenation catalyst.

2. The process of Claim 1 wherein the microstructure control agent is present in a concentration such that the rate of polymer chain propagation substantially exceeds the rate of chain die-out.

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3. The process of Claim 2 wherein the microstructure control agent is diethyl ether.
4. The process of Claim 3 wherein the diethyl ether is present in step (a) at a concentration of from about 6 to about 9 percent.
5. The process of Claim 4 wherein the diethyl ether is present in step (a) at a concentration of about 8 percent.
6. The process of Claim 2 further comprising a step (e-1) wherein after step (e) but prior to step (f) the living block copolymer is terminated.
7. The process of Claim 6 wherein the termination is accomplished using methanol as a termination agent.
8. The process of Claim 6 wherein step (f) occurs in the first reactor.
9. The process of Claim 6 additionally comprising step (e-2) wherein after step (e-1) but prior to step (f), the terminated block copolymer is transferred to a second reactor.
10. The process of Claim 2 additionally comprising a steps (e-I) and (e-II) that occur after step (e) but prior to step (f) wherein in step (e-I) an alkenyl aromatic hydrocarbon monomer is charged to the first reactor and in step (e-II) sufficient time for the living polymer to react with and incorporate the alkenyl aromatic monomer is allowed to pass.

11. The process of Claim 2 wherein the alkenyl aromatic hydrocarbon is styrene.
- 5 12. The process of Claim 11 wherein the conjugated diene monomer is butadiene.
13. The process of Claim 12 wherein the block copolymer is a triblock having a structure of styrene-butadiene-styrene.
- 10 14. The process of Claim 12 wherein the anionic polymerization initiator is sec-butyl lithium.
- 15 15. The process of Claim 2 additionally comprising step E1 wherein Step E1 is addition of a coupling agent.